Topic: Line segments, parallel, perpendicular or neither

Question: Each pair of points in the table below are points that lie on the given line. Which two lines are perpendicular to each other?

Line	Point 1	Point 2
$\overleftrightarrow{AB}$	$(-2, 2)$	$(1, 8)$
$\overleftrightarrow{CD}$	$(3, 6)$	$(5, 2)$
$\overleftrightarrow{EF}$	$(3, 0)$	$(7, -2)$

Answer choices:

A $\overleftrightarrow{AB}$ and $\overleftrightarrow{CD}$

B $\overleftrightarrow{CD}$ and $\overleftrightarrow{EF}$

C $\overleftrightarrow{AB}$ and $\overleftrightarrow{EF}$

D None are perpendicular.

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Solution: C

Use the slope formula

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

for each line.

$$\overleftrightarrow{AB}\text{: } m = \frac{8 - 2}{1 - (-2)} = 2$$

$$\overleftrightarrow{CD}\text{: } m = \frac{2 - 6}{5 - 3} = -2$$

$$\overleftrightarrow{EF}\text{: } m = \frac{-2 - 0}{7 - 3} = -\frac{1}{2}$$

$\overleftrightarrow{AB}$ and $\overleftrightarrow{EF}$ have slopes that are negative reciprocals, so they are perpendicular.

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Topic: Line segments, parallel, perpendicular or neither

Question: Each pair of points in the table below are points that lie on the given line. Which lines are parallel to each other?

Line	Point 1	Point 2
$\overleftrightarrow{AB}$	$(0, 3)$	$(6, 7)$
$\overleftrightarrow{CD}$	$(5, 4)$	$(8, 6)$
$\overleftrightarrow{EF}$	$(1, -2)$	$(7, 2)$

Answer choices:

A $\overleftrightarrow{AB}$ and $\overleftrightarrow{CD}$

B $\overleftrightarrow{CD}$ and $\overleftrightarrow{EF}$

C $\overleftrightarrow{AB}$ and $\overleftrightarrow{EF}$

D All three are parallel.

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Solution: D

Use the slope formula

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

for each line.

$$\overleftrightarrow{AB}\text{: } m = \frac{7-3}{6-0} = \frac{2}{3}$$

$$\overleftrightarrow{CD}\text{: } m = \frac{6-4}{8-5} = \frac{2}{3}$$

$$\overleftrightarrow{EF}\text{: } m = \frac{2-(-2)}{7-1} = \frac{2}{3}$$

All three lines have the same slope, so all three are parallel.

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Topic: Line segments, parallel, perpendicular or neither

Question: A quadrilateral has the vertices shown in the table below. Which description best describes the quadrilateral?

Vertex	Point
A	$(-7, 2)$
B	$(2, 5)$
C	$(4, -1)$
D	$(-5, -4)$

Answer choices:

A Rectangle

B Non-rectangular parallelogram

C Trapezoid

D None of these

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Solution: A

Use the slope formula

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

for each side of $ABCD$.

$$\overline{AB}\text{: } m = \frac{5 - 2}{2 - (-7)} = \frac{1}{3}$$

$$\overline{BC}\text{: } m = \frac{-1 - 5}{4 - 2} = -3$$

$$\overline{CD}\text{: } m = \frac{-4 - (-1)}{-5 - 4} = \frac{1}{3}$$

$$\overline{AD}\text{: } m = \frac{-4 - 2}{-5 - (-7)} = -3$$

Opposite sides $\overline{AB}$ and $\overline{CD}$ have the same slope so they are parallel. Likewise, $\overline{BC}$ and $\overline{AD}$ must also be parallel. Therefore, $ABCD$ must be a parallelogram.

Also, adjacent sides $\overline{AB}$ and $\overline{BC}$ have slopes that are negative reciprocals, so they are perpendicular.

In the same way, all pairs of adjacent sides can be shown to be perpendicular, so $ABCD$ must be a rectangle.

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